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ABSTRACT

A nutrition education unit, Rat Pak, developed by Dairy Council, Inc., is an attempt to influence students to make wise food choices. It consists of eleven lessons in an instructional sequence which incorporates the use of white rats as a means of illustrating the effect of improper diet while teaching proper diet. The purpose of this investingation is to determine whether Rat-Pak increases knowledge of nutrition and whether it affects dietary intake. A second intent of the study is to compare the effectiveness of Rat-Pak with other means of teaching nutrition. The study is also planned with the intent of determining an optimal age for utilization of the unit. Results indicate that Rat-Pak increases nutritional knowledge and changes the dietary behavior of students who study the unit (grades 5-8). It is also found to be more effective than nutrition units commonly taught. Results also indicate that an optimal age for utilization of the unit is seventh grade. The results of the study must be considered with caution as several points could be considered weaknesses. For instance, the validity of the dietary analysis as a measure of dietary behavior is questionable. This study reveals areas for further study. It is suggested that teacher cooperation be emphasized in the future and that teacher attitude and knowledge of nutrition and their relationship to student learning, as well as the affective effects of the unit on students be considered. (Author/AM)

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THE EFFECT OF AN INSTRUCTIONAL UNIT INCORPORATING LIVE ANIMALS ON KNOWLEDGE OF NUTRITION FOR DIFFERENT AGE LEVELS [1]

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[2] This paper is based upon research conducted for completion of requirements for the Master of Arts Degree by Miss Roth. Dr. Wunderlich served as her thesis advisor. He currently is a consultant on evaluation and research tasks for Dairy Council, Inc. Other members of the thesis committee were Drs. Paul Westmeyer and William Litzinger.

INTRODUCTION

Malnutrition exists even in America, a land of plenty, and it is not restricted by education, economic status, or race (Ten State Study, 1970). This suggests that people may not be informed of proper nutritional practices or that, though informed, are not aware of the consequences of neglecting such practices. Considerable concern has arisen as a result of this fact related to possible solutions. Harden and Lamb (1970) point to a need for new means of instruction and to the importance of improving dietary habit as well as knowledge.

PURPOSE

A nutrition education unit, Rat-Pak, developed by Dairy Council, Incorporated is an attempt to influence students to make wise food choices. It consists of eleven lessons in an instructional sequence which incorporates the use of white rats as a means of illustrating the effect of improper diet while teaching proper diet. The purpose of this investigation was to determine whether Rat-Pak increases knowledge of nutrition and whether it affects dietary intake. A second intent of the study was to compare the effectiveness of Rat-Pak with other means of teaching nutrition. Finally, the study was planned with the intent of determining an optimal age for utilization of the unit.

REVIEW OF LITERATURE

The utilization of live rats to assist in teaching nutrition is not a new concept. The meaningful and integral inclusion, however, has been slower in

development. Studies that have included this concept, of which Harden and Lamb (1970) and Hamilton and Brown (1968) are examples, have utilized college students and have not included adequate experimental designs. In both studies, there was an increase in nutrition knowledge but no change in dietary behavior.

Baker (1972) incorporated a control group in her investigation of the use of white rats in a nutrition unit and found significant differences in immediate knowledge of and retention of knowledge of nutrition. She, however, found no effect of the unit on dietary intake. Boysen and Ahren (1972) utilized animals with a nutrition unit for second graders, finding changes in knowledge but again no changes in dietary behavior. The literature reveals no study that compares the inclusion of live animals to other means of teaching nutrition. Samples have usually been small, measurement; qualitative and experimental design; inadequate. The pattern of results indicates that use of live animals in a nutrition unit increases knowledge but has not resulted in change in dietary behavior.

The issue of determining an optimal age for introducing such a unit remains an issue. Head (1974) involved fifth, seventh, and tenth grade students in his study. He found that tenth graders who were the only age group to be exposed to the live animals scored significantly below the other two grades. Only seventh graders improved dietary behavior. Baker (1972), Chapman (1969), and Martin (1965) were other studies which revealed no differences between grade levels. Peterson and Kies (1972) suggest the early elementary years be the focus for nutrition education because of the influence for an entire lifetime, while Martin (1965) theorizes that intermediate grades are more advantageous for nutrition instruction. Hence, no conclusion regarding age is evident.

Because of the variety of experimental findings and of definitions, it was

hypothesized that:

1. The post-test scores of students experiencing the biocollation (Rat-Pak) in the classroom will not differ from the pre-test scores of the same students.

2. The post-treatment dietary analysis scores of students experiencing the biocollation (Rat-Pak) in the classroom will not differ from the pre-treatment dietary analysis scores of the same students.

3. The post-test scores of students experiencing the biocollation (Rat-Pak) in the classroom will not differ from the post-test scores of students experiencing other means of nutrition education.

4. There will be no difference in application of knowledge between students experiencing the biocollation (Rat-Pak) in the classroom and those experiencing other methods of nutrition education.

5. There will be no difference in knowledge of nutrition among fifth, sixth, seventh, and eighth grade students experiencing the biocollation (Rat-Pak) in the classroom.

6. There will be no difference in application of nutrition knowledge among fifth, sixth, seventh, and eighth graders experiencing the biocollation (Rat-Pak) in the classroom.

PROCEDURE

The Instructional Materials

Rat-Pak is a three to four week instructional sequence. Different components of the unit have been pilot tested but the entire unit has not been evaluated. The objectives of the unit are that the student will be able to:

1. Classify foods into the Four Food Groups.

2. Identify the key nutrients found in each of the Four Food Groups.

3. Identify number of servings and approximate single servings from each food group.

4. List at least one primary function for each of the key nutrients studied.

5. Identify changes in the test animal's condition that result when one of the Food Groups is omitted from the rat's diet.

Each classroom is supplied with white laboratory rats, food (if necessary), chemicals (if necessary), a manual for each student, and a teachers manual and visuals to supplement the manual. Teachers are also provided with training prior to utilizing the unit.

Experimental Design and Sampling

The design utilized was a 4(treatment) x 4(grades) factorial design. The treatment conditions were similar to those incorporated in a Solomon four group design. Table 1 illustrates the design.

Table 1

Procedure Analyzation for Each Grade

Procedure I	O_1	O_2	X_1	O_3	O_4
Procedure II			X_1	O_3	O_4
Procedure III	O_1	O_2	X_2	O_3	O_4
Procedure IV			X_2	O_3	O_4

O_1 and O_4 represent a pre-dietary and post-dietary analysis respectively. O_2 and O_3 represent pre-tests and post-tests of nutrition knowledge. X_1 represents instruction utilizing Rat-Pak. X_2 represents nutrition instruction by some means other than Rat-Pak and not incorporating live animals. This condition was that usually taught in the schools. Each school incorporated in the study already included a unit on nutrition in its curriculum guide and taught such a unit. These included lectures, texts and films. The pre-test and post-test employed was a 32 item multiple choice exam developed by the experimenter with a split-halves reliability of .91. The dietary analysis consisted of the student

supplying a record of two days of his dietary intake. The diets were then evaluated according to a point system.

The accessible population for this study was the fifth, sixth, seventh, and eighth grade students in five southwestern states served by Dairy Council, Inc. Teachers and classrooms were identified which had expressed a willingness to participate in the evaluation, which were in an area readily served by a consultant of Dairy Council, and which included a nutrition unit in their curricula. At least four teachers were selected randomly from each grade level with more than four being included when school administrators expressed concern that treatment be uniform within a school. Teachers were then assigned to experimental treatment at random with the condition that within a school either only Rat-Pak or only the alternate nutrition unit would be present. Intact classrooms were employed but children whose age differed by two years or more from that for their grade level were excluded from analysis of results. As a result of the training given them, teachers were responsible for conducting the experiment within their classes including administering the pre-measures and post-measures. The dietary analysis were evaluated by the experimenters.

The Experiment

After pilot testing the procedure and instruments and making revisions based on this experience, the selection and training of teachers was undertaken. The sample in the study consisted of 29 teachers who were responsible for 1,447 students. Table 2 reflects the number of subjects per cell for the study. (See page 6 for Table 2) Several cells were large because of school policy regarding uniform curriculum. Some difficulty was encountered in obtaining teacher cooperation for the control situations, e.g. two teachers who had agreed to cooperate, did not gather dietary intake from their classes. Approximately 8.1% of the stu-

dents from classrooms selected were excluded due to age, absence or other complication. The instruction and data collection were complete prior to December 20, 1974.

Table 2

Number of Students in Various Procedure Groups

	Procedure I	Procedure II	Procedure III	Procedure IV	Total
Grade 5	77	17	51	43	188
Grade 6	215	298	103	15	631
Grade 7	140	134	75	25	374
Grade 8	52	106	63	33	254
Total	484	555	292	116	1447

RESULTS

Table 3 displays descriptive statistics for each of the cells of the experiment. (See page 7 for Table 3) The maximum score on the pre-test and post-test was 32 and on the dietary analysis, 108.

To determine whether the pre-instructional measures had a teaching effect, post-knowledge scores of Groups III and IV were compared utilizing a 2 x 4 analysis of variance design including grades. No difference in treatments were present ($F_{1,400} = 2.15$). Similarly, post-knowledge scores of Groups I and II were compared ($F_{1,1031} = 20.62$). There was an interaction of the pre-tests with the Rat-Pak treatment. Similar analysis of post-dietary analysis Groups III and IV ($F_{1,284} = 11.63$) and for Groups I and II ($F_{1,1031} = 47.02$) revealed that the

Table 3

Means and Standard Deviations of Rat-Pak Instrumentation

Treatment Group	Grade	Group	Pre-test		Pre-dietary Analysis		Post-test		Post-dietary Analysis	
			Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
I	Fifth	77	16.44	03.87	59.13	18.60	22.36	04.88	62.29	20.42
	Sixth	215	15.79	4.65	44.02	16.75	21.50	05.76	52.94	25.55
	Seventh	140	18.67	5.72	74.39	21.80	25.84	06.07	74.99	23.84
	Eighth	52	17.58	3.75	31.42	10.25	24.35	03.71	40.08	08.12
	Total	484	16.91		53.85		23.20		59.43	
II	Fifth	17					23.12	04.59	86.94	06.41
	Sixth	298					25.73	04.95	68.67	21.31
	Seventh	134					25.57	05.35	60.93	32.29
	Eighth	106					27.87	03.76	69.72	16.58
	Total	555								
III	Fifth	51	16.25	2.46	58.80	17.25	17.04	03.25	60.75	18.80
	Sixth	103	18.59	4.74		33.86	19.69	04.81		
	Seventh	75	18.55	4.80	48.95	14.76	20.84	06.52	45.51	32.86
	Eighth	63	20.44	4.11	48.24		21.76	04.19	48.52	13.72
	Total	592	18.57				19.97			
IV	Fifth	43					17.77	05.55	60.47	19.09
	Sixth	15					20.33	04.84	57.65	23.21
	Seventh	25					23.48	05.56	66.24	21.04
	Eighth	33					21.24	05.33	51.47	14.30
	Total	116								

pre-tests effected dietary behavior regar_less of treatment experienced. There were significant grade differences in each of these analysis, but the presence of treatment differences reflects the influence of the pre-tests on the instructional sequence and its effect.

To determine whether or not Rat-Pak resulted in increased knowledge of nutrition and changed dietary behavior (Hypotheses 1 and 2) a repeated measures analysis of variance was employed. Results are reflected in Table 4 and Table 5.

Table 4

Effectiveness of a Biocollation on Knowledge, Treatment Group I

Source	MS	df	F	p
Treatment	9534.55	1	710.07	.00
Error	13.43	480		
Grades	786.77	3	19.52	.00
Error	40.31	480		

Table 5

Analysis of Application of Knowledge, Procedure Group I

Source	MS	df	F	p
Treatment	7514.27	1	37.51	.00
Error	200.16	480		
Grades	55924.17	3	85.00	.00
Error	657.96	480		

Thus the Rat-Pak unit did increase knowledge of nutrition and did change dietary behavior.

Analysis of covariance was employed on the post-measures of Groups I and III with pre-experimental measures as covariables to determine whether Rat-Pak differed from other commonly employed units on nutrition (Hypotheses 3 and 4). Analysis of post-knowledge scores ($F_{1,767} = 134.03$) and of post-dietary analysis ($F_{1,450} = 12.56$) revealed that Rat-Pak was more effective than other units on nutrition. The reduced sample for dietary analysis was due to lack of cooperation by sixth grade teachers. Hypothesis 5 related to interaction of age and treatment was not rejected. Tables 6 and 7 reflect adjusted means for the cells of the 2(Groups I and III) x 4(grades) analysis.

Table 6

Adjusted Mean Scores for Knowledge, Groups I and III

	Grade 5	Grade 6	Grade 7	Grade 8	Total
Group I	22.36	21.50	25.84	24.35	23.51
Group III	17.04	19.69	20.84	21.76	19.83

Table 7

Adjusted Mean Scores for Dietary Analysis, Groups I and III

	Grade 5	Grade 6	Grade 7	Grade 8	Total
Group I	62.29	52.94	74.99	40.08	57.57
Group III	60.75	xx.xx	45.51	48.52	51.59

Hypotheses 6 and 7 were tested by use of a simple analysis of covariance on the four age groups on the two post-measures while employing the corresponding pre-measures as covariables. Analysis of the knowledge of nutrition scores ($F_{3,480} = 8.9$) revealed that there were grade differences as reflected in Table 6. No post hoc analyses were performed to determine which adjusted means differed. Analysis of dietary behavior ($F_{3,480} = .77$) revealed no differences in dietary behavior among the age groups.

CONCLUSIONS

Rat-Pak was found to increase knowledge of nutrition and to change dietary behavior of individuals studying the unit. It was also found to be more effective than nutrition units commonly taught. Table 8 reflects the degree to which Rat-Pak was more effective than the alternative units.

Table 8

Pre- and Post-Test
Mean Scores of Evaluatory Instruments,
Groups I and III

Group	Pre-test	Post-test	Difference	% Increase
I	16.91	23.20	6.29	37%
III	18.57	19.97	1.40	8%

Results of this study reveal that an optimal age for utilization of Rat-Pak is seventh grade.

This study reveals the effectiveness of Rat-Pak as an instructional unit on nutrition enhancing knowledge of nutrition, which other studies discussed earlier

have done, but importantly also enhancing dietary behavior. Furthermore, the superiority of Rat-Pak over units usually incorporated in classes is also emphatically revealed. The results of the study, however, must be considered with some caution as the following points could be considered weaknesses. First, monitoring of activities in both the experimental and control settings would have strengthened the internal validity. Validity of the dietary analysis as a measure of dietary behavior is also questionable. How much control over dietary intake an adolescent has, is questionable. Finally, this was a complete instructional unit which meaningfully incorporated the white rats into the instruction and is not a study of the effects of the white rats alone.

This study revealed several areas for further study. These are:

1. The effect of this and similar units on retention of knowledge and behavior should be studied.
2. The variation of the effect of the white rats on individual student should be considered. White rats may reflect extremely unpleasant experiences for some.
3. Teacher cooperation must be emphasized. Although this study attempted to train teachers, they still did not cooperate in all facets of the study.
4. Teacher attitude and knowledge of nutrition and their relationship to student learning must be considered.
5. Affective effects of the unit on students should be considered.

People are not born with the ability to make wise food choices. Like many other aspects of daily life, proper dietary intake must be learned. Rat-Pak is one way that this desired learning may be accomplished.